Threatened juvenile salmon get help from PNNL

Research has found that thousands of miles of essential juvenile salmon habitat are blocked by tens of thousands of culverts that lay beneath Pacific Northwest roadways. Many of these culverts that have successfully channeled water under roadbeds for years are acting as barriers to young salmon and preventing the upstream passage the fish require for growth and development.

To find a more "fish friendly" design for the culverts, the Washington State Department of Transportation has hired Pacific Northwest National Laboratory to design and install a culvert test bed.

"We're blending the expertise of hydraulics engineers, mechanical engineers, statisticians, fish biologists and fish-behavior specialists to find a solution to a problem that faces the entire Northwest and has implications for culverts throughout the country," said Walter Pearson, PNNL fish behaviorist and program manager.

The full-scale, one-of-a-kind test bed is located at the Washington Department of Fish and Wildlife Skookumchuck Hatchery near Tenino, Wash.

The system allows scientists to adjust and measure the hydraulic conditions — water velocity, turbulence and depth — of various culvert designs being evaluated. By assessing different slopes and flow patterns, scientists can determine how these conditions influence the behavior of the fish and their ability to pass through a variety of culvert designs being considered as retrofits for existing culverts.

"There are hundreds of possibilities for bed configurations," Pearson said. "A particular design may stop passing fish at some flow rate or some slope and that's what we'll be looking for. This will help us design stream crossings that accommodate fish in all life stages."

The ability to quickly receive research results on these configurations is very appealing to transportation agencies. "Testing culvert designs in a controlled setting will help us better understand how we can meet fish passage needs in a variety of conditions," said Jon Peterson of WSDOT's Environmental Services Office. In coming years, tens of millions of dollars will be spent improving culvert fish passageways in Washington State alone.

U.S. Rep. Norm Dicks has recognized the need for greater federal involvement in removing these barriers to fish passage. "This is a critical issue requiring solid science to help maintain the health of our streams and the well-being of our fish runs," Dicks said. "Decisions made based on research at this facility will benefit us for decades to come."

Attempts to retrofit culverts are not new. Baffles, weirs, ladders and other physical structures have been added to enhance fish passage over the years, but there are insufficient data to demonstrate the effectiveness of these efforts. The program will provide decision-makers scientifically sound data to retrofit existing culverts and develop better designs for new culvert installations. "Investing in this system provides WSDOT with improved scientific data to ensure that we're spending money on solutions for fish passage that will work to provide long-term benefits to our environment," said Peterson.

Passage of juvenile salmon through culverts is a significant Endangered Species Act issue for the Pacific states. A transportation consortium that includes the states of California, Oregon, Washington and Alaska, along with the Federal Highway Administration, pooled funds totaling $1.16 million to contract with PNNL to conduct the first phase of a five-year, $3.4 million, interdisciplinary program. Scientists with extensive natural resources and hydraulics expertise from PNNL's Marine Sciences Laboratory in Sequim, Wash., and from PNNL's Hydrology Group in Richland designed, installed and will operate the culvert test bed. ■